REMARKS

Applicants gratefully acknowledge the Examiner's Interview with Examiner Graybill held on March 5, 2003 (see Examiner's Interview Summary).

As an initial matter, Applicants respectfully traverse the Examiner's objection to the drawings (Office Action, dated December 31, 2002, page 2, lines 9-13) for the following reasons. First, the drawings include Figures 1, 2 and 3 and completely satisfy the requirements of 37 C.F.R. 1.83(a). Second, the burden is on the Examiner to point out any defects in the drawings. The Examiner has not pointed out any specific defect that should be corrected. Applicants point out that the Examiner was unable to point out any defect in Applicants' drawings even though Applicants' attorney asked Examiner Graybill at the Examiner's Interview to point out the alleged defects in the drawings.

Claims 20, 35 and 36 have been canceled without prejudice. Claims 17-19, 21-34 and 37-50 have been amended to improve grammar and clarity by reciting "an organic die-bonding film" in the preamble. Additionally, claim 17 has been amended to incorporate the subject matter of dependant claim 35, and claim 30 has been amended to incorporate the subject matter of dependant claim 36. Thus, claim 17 now has the scope of claim 35 and claim 30 has the scope of claim 36. Claim 19 has also been amended to recite "the film comprises an organic material selected from the group consisting of epoxy resin, silicone resin, acrylic resin and polyimide resin" and to point out that the film is a "single layer." Claims 18, 19, 21, 28 and 29 have been amended to depend directly or indirectly upon claim 19. Claim 24 has been amended to depend upon claim 23. Claims 39-44 have been amended to depend upon claim 37. Claims 46, 48 and 50 have been amended to depend upon claim 30. Claims 47 and 49 have been amended to depend upon claim 17.

Applicants believe that the present amendment adds no new matter to the application. In view of the amendment, and for the following reasons, Applicants respectfully request that the present application be reconsidered and the claims allowed.

The Invention

The present invention pertains broadly to a filmy material for a semiconductor device having a support member such as a lead frame to which a semiconductor die or chip is attached using the die-bonding material and encapsulated with resin. More particularly, one preferred embodiment in accordance with the present invention is an organic die bonding film having a peel strength of 0.5 kgf/(5 mm x 5 mm chip) or higher when a semiconductor has been bonded to a support member with said film under conditions of 100-230°C temperature and pressure of 0.1-30 gf/mm^2, wherein said film comprises an organic material selected from the group consisting of epoxy resin, silicone resin, acrylic resin and polyimide resin.

A second embodiment in accordance with the present invention is an organic die-bonding single layer film having the property of bonding a semiconductor chip to a support member under conditions of 100-230°C temperature and pressure of 0.1-30 gf/mm^2, and having a modulus of elasticity of 10 MPa or less at a temperature of 250°C, wherein the film comprises an organic material selected from the group consisting of epoxy resin, silicone resin, acrylic resin and polyimide resin.

A third embodiment in accordance with the present invention is an organic die-bonding film having the property of bonding a semiconductor chip to a support member under conditions of 100-250°C temperature and pressure of 0.1-30 gf/mm^2, wherein the film has a water absorption of 1.5% by volume or less, a saturation moisture absorption of 1.0%

by volume or less, a modulus of elasticity of 10 MPa or less at a temperature of 250°C, a void volume of 10% or less in terms of voids present in the film and at an interface between said film and a support member at a stage where a semiconductor has been bonded to a support member by said film, a peel strength of 0.5 kgf/(5 mm x 5 mm chip) or higher at a stage where a semiconductor has been bonded to a support member with said film, and a residual volatile component in an amount of not more than 3.0% by weight, wherein the film comprises an organic material selected from the group consisting of epoxy resin, silicone resin, acrylic resin and polyimide resin.

All of the remaining dependent claims recite various other preferred embodiments. The advantages of the preferred embodiments of the film material in accordance with the present invention is that the film material allows for the manufacture of semiconductor devices that have fewer flow cracks and other defects that devices made with silver paste have because the material of the present invention is less prone to forming reflow cracks during the fabrication of semiconductor devices. Thus, devices made with the film material in accordance with the present invention can be reliably manufactured to have good durability that is an improvement over the prior art devices.

The Rejections

Claims 17-50 stand rejected under 35 U.S.C. 112, first paragraph, for lacking an adequate written description and for lacking enablement. Claims 17-50 also stand rejected under 35 U.S.C. 112, second paragraph, as indefinite. Claims 17-19, 21-27, 31, 33, 35, 37, 40 and 42-50 stand rejected under 35 U.S.C. 103(a) as unpatentable over Morita (U.S. Patent 5,406,124). Claims 20, 28-30, 32, 34, 36 and 38 stand rejected under 35 U.S.C. 103(a) as unpatentable over Morita in view of Hozoji (Japanese document JP 5-218107). Claim 39 stands rejected under 35 U.S.C. 103(a) as unpatentable over Morita in view of Jackson (U.S.

Patent 4,965,331). Claim 41 stands rejected under 35 U.S.C. 103(a) as unpatentable over Morita in view of Baumann (U.S. Patent 5,296,567).

Applicants traverse the rejection and request reconsideration for the following reasons.

Applicants' Arguments

Rejections under 35 U.S.C. 112, first paragraph

In view of the present amendment, Applicants believe claims 17-19, 21-34 and 37-50 comply with the written description and enablement requirements of 35 U.S.C. 112, first paragraph. Specifically, all of the independent claims now recite "an organic die-bonding film" wherein the film "comprises an organic material selected from the group consisting of epoxy resin, silicone resin, acrylic resin and polyimide resin."

The description must clearly allow persons of ordinary skill in the art to recognize that the inventor invented what is claimed. Union Oil Co. v. Atlantic Richfield Co., 54 USPQ2d 1227, 1232 (Fed. Cir. 2000). There is a strong presumption that an originally filed claim satisfies the written description requirement of 35 U.S.C. 112. In re Wertheim, 191 USPQ 90, 98 (CCPA 1976). Therefore, it is the Examiner's burden to present evidence or show reasons why persons skilled in the art would not recognize in the disclosure a description of the invention defined by the claims. Id. at 97.

The Examiner's position is that the present application does not provide a sufficient description of a representative number of species to show applicants had possession of the claimed genus (Office Action, dated December 31, 2002, page 3, lines 33-41). Applicants disagree in view of the present amendment. All of the independent claims recite "an organic die-bonding film" wherein the film "comprises an organic material selected from the group consisting of epoxy resin, silicone resin, acrylic resin and polyimide resin."

Claim 17 corresponds to original claim 35, and independent claim 30 corresponds to original claim 36. Claims 17 and 30 therefore enjoy a strong presumption that they satisfy the written description requirement of 35 U.S.C. 112. Moreover, the present specification adequately supports the claimed species as shown by the words, examples and tables describing various properties of the die-bonding films in illustrative Examples 1-7 in accordance with the present invention (specification, page 3, lines 20-25, page 11, line 14 to page 17, line 8, and page 18, line 15 to page 36, line 26). The burden is now on the Examiner to provide evidence to show why one of skilled in the art would doubt that Applicants had possession of the claimed subject matter at the time of filing.

The Examiner admits that the present application is properly described and enabled for the species disclosed in illustrative Examples 1-7 (Office Action dated December 31, 2002, page 4, lines 13-14), which correspond to claims 39-44. Therefore, the Examiner concedes that claims 39-44 comply with § 112. In view of the present amendment limiting the invention to an "organic die-bonding film" genus that includes organic material species selected from the group consisting of epoxy resin, silicone resin, acrylic resin and polyimide resin, the instant specification is enabling for the present genus.

Rejections under 35 U.S.C. 112, second paragraph

Applicants assert claims 17-19, 21-34 and 37-50 are in compliance with 35 U.S.C. 112, second paragraph.

The courts have held that for a claim to comply with 35 U.S.C. 112, second paragraph, it must (1) set forth what the applicant regards as his invention, and (2) it must do so with sufficient particularity and distinctness to be definite. Solomon v. Kimberly-Clark Corp., 55 U.S.P.Q.2d 1279, 1282 (Fed. Cir. 2000). The definiteness of the claim language must be analyzed in light of the teachings of the prior art and of applicant's disclosure as it would be interpreted by one possessing ordinary skill in the pertinent art. Id. When applicant

has claimed what he regards as his invention, a rejection under 35 U.S.C. 112, second paragraph, must be justified on the grounds that the language used is not precise and definite enough to indicate the scope of the claim, or the language is so broad that it causes the claim to have a scope of protection beyond that which is justified by the applicant's disclosure. In re Swinehart, 169 U.S.P.Q. 226, 229 (CCPA 1971).

In the present case, there is no dispute that the Applicants have claimed what is regarded as the invention. The Examiner asserts that the issue is claim scope (Office Action, dated December 31, 2002, page 5, line 9, to page 6, line 19). Specifically, the Examiner appears to assert that the functional language in claims 17-22 is not precise and definite enough to indicate the scope of the claims, and that the language is so broad that it has a scope of protection beyond the applicants' disclosure. Applicants disagree for the following reasons.

1. Claim language is definite

Specifically, claim 17 of the present invention recites

> "[a] An organic die bonding film having a peel strength of 0.5 kgf/(5 mm x 5 mm chip) or higher when a semiconductor has been bonded to a support member with said film under conditions of 100-230°C temperature and pressure of 0.1-30 gf/mm^2, wherein said film comprises an organic material selected from the group consisting of epoxy resin, silicone resin, acrylic resin and polyimide resin."

In the present case, the invention is an organic die bonding film having an adhesive property referred to as "peel strength," which is further described by the functional language "when a semiconductor has been bonded to a support member with said film under conditions of 100-230°C temperature and pressure of 0.1-30 gf/mm^2." The Morita et al. reference describes adhesive polyimide films having a "physical property such as adhesive strength" (col. 2, lines 32-60). In other words, one of ordinary skill in the art would realize that adhesive strength is a physical property of adhesive films. Morita et al. taught the use of a "90-degree peeling strength test" for determining the "90-degree peeling strength" of

insulating adhesive tape test samples (col. 17, line 13, to col. 18, line 10). Thus, the prior art suggests to one skilled in the art that a 90-degree peeling strength test is a test of adhesive strength of adhesive agents, such as adhesive tape.

Applicants' disclosure plainly defines "peel strength refers to the peel strength of the filmy organic die-bonding material at the stage where the semiconductor chip is bonded to the support member through the filmy organic die-bonding material" (Applicants' specification, page 31, lines 8-11). In addition, Applicants' described in detail how peel strength was measured for the purposes of the present invention (Applicants' specification, page 33, lines 1-16, and figure 2), which one skilled in the art would recognize defines a 17-degree peel strength.

Thus, one skilled in the art would appreciate from reading the Morita et al. reference and the Applicants' disclosure that peel strength is a physical property of die-bonding films, and that there is nothing indefinite about reciting "an organic die-bonding film having a peel strength."

The Examiner's position that "peel strength is not an intrinsic property of a single material" goes against the explicit teachings of the Morita et al. reference and the implicit teachings of Applicants' disclosure. Even so, the language of claim 17 defines "peel strength... when a semiconductor has been bonded to a support member with said film," which should satisfy the Examiner's requirement that "peel strength is a measurement of the strength of an adhesive bond between two or more materials" (Office Action, dated December 31, page 5, lines 17-19).

The arguments applied to claim 17 also apply to claims 19 and 30 as amended.

2. Claim language is not too broad.

The Examiner appears to assert that claim 17 is too broad because the composition or structure of the material that satisfies the peel strength limitation is not disclosed or cannot be

determined from the claim (Office Action, dated December 31, 2002, page 5, line 20, to page 6, line 4). In view of the present amendment, claim 17 recites that the "film comprises an organic material selected from the group consisting of epoxy resin, silicone resin, acrylic resin and polyimide resin." Applicants' specification describes this limitation on page 3, lines 20-23), so independent claims 17, 19 and 30 are all limited to compositions justified by the Applicants' disclosure. Applicants also point out that various dependent claims define other embodiments in accordance with the present invention that have even more specific compositions, such as claims reciting specific polyimide resins (i.e., claims 39-44) and metal fillers (i.e., claim 48).

Rejections under 35 U.S.C. 103

The Morita reference discloses an "insulating adhesive tape," that includes a base supporting film and an adhesive layer formed on at least one surface thereof (see Abstract). As shown in Figure 4, the adhesive tape includes base supporting film (41) and two adhesive layers (42) and (43). Each adhesive layer (42), (43) is a thermoplastic polymer comprising a thermoplastic polyimide, wherein the polymer has a glass transition temperature ranging from 180°C to 280°C and an elastic modulus ranging from 10^{10} dyne/cm^2 to 10^{11} dyne/cm^2 at 25°C, wherein the elastic modulus includes a value ranging from 10^2 dyne/cm^2 to 10^9 dyne/cm^2 at a temperature between 250°C and 300°C. The Morita reference discloses that the thermoplastic polymer has a water absorbing ratio of less than 1.2% (col. 9, lines 14-16); however, Morita does not explicitly state to what the percentage is relative. Specifically, the Morita reference only describes % by weight (col. 9, lines 35-39 and lines 53-55); therefore, it is suggested that Morita describes that the water absorbing ratio is less than 1.2% by weight. There is nothing in the Morita et al. reference to teach, or even suggest, that the water absorption is 1.5% by volume or less.

The Morita reference clearly discloses a three layer tape (4). The Morita reference does not teach, or even suggest, an "organic die-bonding single layer film" having the features recited in claim 19.

The Morita reference also discloses that the adhesive temperature for bonding IC chips to lead frames using the adhesive tape is selected from the range of 250-450°C (preferably 270-400°C) and the adhesive pressure is 1-50 kg/cm^2 (preferably 5-30 kg/cm^2), (col. 14, lines 3-14). However, the present invention has the advantage that die bonding can be carried out at significantly lower temperatures and pressures than the prior art. The present claims recite "conditions of 100-230°C temperature and pressure of 0.1-30 gf/mm^2" in independent claims 17-22. As the Morita et al. reference does not teach, or even suggest, a bonding temperature of less than 250°C, Morita et al. can not anticipate or make obvious the recited temperature range 100-230°C in combination with a pressure of 0.1-30 gf/mm^2.

Furthermore, Applicants point out that the Examiner states that the Morita reference does not disclose "a peel strength of 0.5 Kgf/5mm x 5mm chip or higher at the stage" (Office Action, dated December 19, 2001, page 8, lines 4-8; Office Action dated December 31, 2002, page 13, lines 15-17), but the Examiner asserts that, in the absence of unexpected results, such an increase in peel strength would be "ascertainable by routine experimentation and optimization" (Office Action, dated December 19, 2001, page 8, line 14 to page 9, line 5; December 31, 2002, page 14, line 1-9); however, the Examiner does concede that "a disclosure that the limitations...produce an unexpected result, or are otherwise critical" would rebut any established prima facie case of obviousness. Applicants provide more than sufficient evidence of unexpected results as described below.

The courts have held that to reject claimed subject matter in view of a combination of prior art references, a proper analysis under 35 U.S.C. 103 must show that (a) the prior art would have suggested to those of ordinary skill in the art that they should make the claimed

composition or device, (b) the prior art reveals that in so making, one of ordinary skill would have a reasonable expectation of success, and (c) both the suggestion and the reasonable expectation of success is found in the prior art and not in applicant's disclosure. In re Vaeck, 20 USPQ2d 1438, 1442 (Fed. Cir. 1991).

The Hozoji reference discloses a "resin-sealed semiconductor device" wherein a die pad and a semiconductor element are fixed by using an adhesive layer in which a base material having a low moisture absorption rate (i.e. glass cloth or metal foil) is impregnated or coated with a bisphenol type epoxy resin, wire bonded, and with resin containing one or more of epoxy, phenol or polyimide resins (see Abstract). In addition, Hozoji teaches several desired low water absorption rates being changes in weight over a period of time (see paragraph [0016] and Table 1). Hozoji does not teach that the saturation moisture absorption is 1.0% by volume or less as recited in claims 18, 26, and 28-30. The Examiner asserts that Hozoji teaches "a material having a void volume of 10% or less" and that combining the product of Hozoji with the product of Morita...would facilitate adhesion" and presumably would still have a void volume of 10% or less (Office Action, dated December 31, 2002, page 16, lines 1-12). However, the Examiner has provided no evidence to suggest that combining the product of Hozoji with the product taught by Morita would reasonably result in a product that has a void volume of 10% or less. Furthermore, there is no reason to expect that mixing these two adhesives together would result in a mixture that would have any of the properties recited in Applicants' claims. It is more likely that mixing the Hozoji adhesive with the Morita et al. adhesive would result in a mixture that would have less than all of the properties of Applicants' claimed film. In other words, the Examiner's proposed combination of the Hozoji reference with the Morita et al. reference is untenable and should be withdrawn because the Examiner has not shown there is a reasonable expectation of success taught by the prior art to justify mixing the adhesive taught by Hozoji with the

adhesive taught by Morita et al. to arrive at an adhesive having a void volume of 10% or less while retaining all of the other properties of the Morita et al. adhesive.

The Jackson reference discloses "curable resin compositions," and the Baumann et al. reference discloses "thermocurable compositions;" however, each of these references is silent with respect to the claimed characteristics of peel strength recited in claims 17, 29 and 30, and claimed saturation moisture absorption recited in claims 18, 26 and 28-30. Furthermore, neither the Jackson reference, nor the Baumann et al. reference, disclose the claimed bonding "conditions of 100-230°C temperature and pressure of 0.1-30 gf/mm^2" recited in claims 17, 19 and 30.

In summary, any combination of the Morita et al. reference, the Hozoji reference, the Jackson reference, and the Baumann et al. reference would not teach, or even suggest, an "organic die-bonding film" having the "a peel strength of 0.5 kgf/(5 mm x 5 mm chip) or higher when a semiconductor has been bonded to a support member with said film under conditions of 100-230°C temperature and pressure of 0.1-30 gf/mm^2" as recited in claims 17 and 30. Furthermore, any combination of the Morita et al. reference, the Hozoji reference, the Jackson reference, and the Baumann et al. reference would not teach, or even suggest, an "organic die-bonding single layer film" having the features recited in claim 19. The Examiner's rejection of claims 18, 26, and 28-30 is untenable and should be withdrawn because there is no reasonable expectation taught by the prior art that mixing the adhesive taught by Hozoji to the adhesive taught by Morita et al. would result in a mixed adhesive having all of the features of these claims.

Unexpected and Superior Results of the Present Invention

Applicants previously submitted for the Examiner a Declaration by Takashi Masuko (hereafter the "Masuko Declaration"), dated March 5, 2002, filed in accordance with 37 C.F.R. 1.132. The Masuko Declaration establishes that when the novel film (see Section 7 on

page 3) in accordance with the present invention is compared to the prior art film (see Section 6 on page 3) disclosed by Morita et al. under identical experimental conditions, the result is that the novel film of the present invention demonstrates an "**unexpected invulnerability**" (page 7, lines 4-8). As shown in Table 2, when evaluating the two films for the occurrence of reflow cracks it was shown that while **all** of the Morita film samples under the given die-bonding conditions manifested reflow cracks, **none** of the samples made in accordance with the present invention had reflow cracks.

The courts have held that there is no requirement for the unexpected results relied upon for patentability to be recited in the claims so long as the features responsible for the unexpected results are recited in the claims. In re Merchant, 197 USPQ 785, 788 (CCPA 1978). In the present case, the properties of the film are the "features" of the film responsible for the unexpected results. Specifically, the organic die-bonding film made in accordance with the present invention must have the property of bonding under the conditions of 100-230°C temperature and pressure of 0.1-30 gf/mm^2, and must comprise an organic material selected from the group consisting of epoxy resin, silicone resin, acrylic resin and polyimide resin as recited in independent claims 17, 19 and 30.

In addition, when peel strength was measured (Masuko Declaration, section 8) the peel strength was significantly greater for the novel film of the present invention over the Morita film (see Table 1). In fact, when the die-bonding condition was set as "250°C x 30gf/mm^2 x 20 sec," as in claim 30, all of the chips made using the novel film were destroyed during testing because the bond strength was stronger than the chip. In other words, the bond strength of the material in accordance with the present invention was stronger than what this particular test could measure! Clearly, this is another superior and unexpected result.

In view of the Masuko Declaration, the prima facie case of obviousness standing against claims 17-19, 21-35 and 37-50 has been sufficiently rebutted to be overcome by the

factual results, wherein the organic die-bonding film of the present invention manifests unexpected invulnerability to reflow cracking. Furthermore, when the property of 17 degree peel strength is considered, the prima facie case of obviousness standing against claims 17 and 30 is additionally rebutted. In these claims, the material includes the property of "a peel strength of 0.5 kgf/(5 mm x 5 mm chip) or higher," which is not attainable by the comparison prior art film material made in accordance with the teachings of the Morita et al. reference.

Sufficiency of the Masuko Declaration

The Examiner asserts that the Masuko Declaration is "insufficient" for the following reasons: (a) "it refers only to the system described in the application and not the individual claims of the application," (b) "the objective evidence of nonobviousness is not commensurate in scope with the claims," (c) "it does not compare the claimed invention with the closest prior art," (d) there is no conversion factor between the 90 degree peel strength property taught by Morita et al. and the 17 degree peel strength property used in the Masuko Declaration so no 17 degree peel strength comparison can be made between a die-bonding film disclosed by Morita and a die-bonding film provided by the present invention, and (e) the Morita et al. reference teaches unexpected results at col. 7, lines 65-68, that renders the results provided by the present invention as "not unexpected" (Office Action, dated December 31, 2002, page 20, line 3, to page 21, line 16).

Response to (a)

The Examiner argues that the Masuko Declaration is insufficient because it does not refer to individual claims in the application and cites MPEP 716 as supporting authority (Office Action, dated December 31, 2002, page 20, lines 6-10). Applicants traverse the Examiner's position on the basis that MPEP 716 does not require the declaration itself to refer to individual claims. The burden is now placed on the Examiner to show where in the MPEP there is a requirement that the declaration itself refer to any individual claims. The

courts require only that "the objective evidence of nonobviousness ...be commensurate in scope with the claims." In re Clemens, 206 USPQ 289, 296 (CCPA 1980). In the present case, the evidence is clearly commensurate in scope with the claims.

Response to (b)

The Examiner argues that the Masuko Declaration is insufficient because the objective evidence of nonobviousness is not commensurate in scope with the claims (Office Action, dated December 31, 2002, page 20, lines 11-16). In particular, the Examiner argues that the showing of unexpected results have not been determined to occur over the entire claimed range and cites In re Clemens at 296 in support of this position. Applicants point out that the Examiner has misapplied In re Clemens in the present case.

In Clemens at 292, the condensate polishing process set forth in claims 1-7 and 9-10 differed from the prior art only by the utilization of VBC-based resins, whereas the prior art used CME-based resins. Both parties maintained that the two kinds of resins had very similar structure and that one skilled in the art would have substituted one for the other as prima facie obvious. The unexpected results of comparative testing of the two kinds of resins demonstrated that in the temperature range of 110°C to 130°C the VBC-based resins were significantly more thermally stable than the CME-based resins; however, as recited in the base claim 1 the phrase "elevated temperature" that was interpreted to include temperatures of 60°C, where CME-based resins were thermally stable. Therefore, the court concluded that the probative value of the narrow range of data could not be reasonably extended to prove unobviousness of the broader range of "elevated temperature" that included 60°C. On the other hand, the court held that the comparative data did prove that claim 8, which recited "at

a temperature in excess of 100°C," was unobvious over the prior art. In re Clemens, 206 USPQ 289, 296 (CCPA 1980).

In the present case, one of ordinary skill in the art would readily appreciate that the objective evidence provided in Table 1 of the Masuko Declaration is commensurate in scope with claims 17-19, 21-34 and 37-50. Specifically, the three sets of temperature and pressure die-bonding conditions tabulated in Table 1 of the Masuko Declaration all fall within the temperature and pressure condition ranges recited in claim 30, and independent claims 17 and 19 fall within the temperature and pressure die-bonding conditions of at least one set of experimental conditions. In addition, only the 17 degree peel strengths of the organic die-bonding film having the bonding properties recited in accordance with claims 17 and 30 achieve the explicitly required peel strength of 0.5 kgf/(5 mm x 5mm chip) or higher. On the other hand, the organic die-bonding film made in accordance with the teachings of the Morita et al. reference failed to achieve a peel strength of 0.5 kgf/(5 mm x 5 mm chip) or higher. The facts of the present case are similar to claim 8 in Clemens, which is the claim the court concluded was allowable because it recited temperature conditions that were within the experimental temperature conditions provided in the Rule 132 Declaration. In view of the present facts, and in view of the analysis of Clemens, it is clear that the objective evidence presented in Table 1 of the Masuko Declaration is commensurate in scope with claims 17-19, 21-34 and 37-50.

Response to (c)

The Examiner argues that Applicants have not compared the present invention to the closest prior art (Office Action, dated December 31, 2002, page 20, line 17 to page 21, line 3). Specifically, the Examiner argues that the closest prior art would be identical to the present invention because Morita et al. lists an "identical polyimide" to the present invention (Office Action, dated December 31, 2002, page 20, line 21 to page 21, line 3). At the

Examiner's Interview conducted March 5, 2003, Applicants' attorney asked Examiner Graybill to point out what in the prior art was closer than Example 1 of the Morita et al. reference. Examiner Graybill was unable to do so. Because Examiner Graybill is unable to point out something in the prior art closer to Applicants' invention than Example 1 of Morita, Examiner Graybill's opinion asserting there is something closer in the prior art to Applicants' invention is untenable and should be withdrawn.

Even so, the courts have held that when comparative data is presented, there is no requirement that the Applicant compare "the results of the invention to the results of the invention." In re Chapman, 148 USPQ 711, 714 (CCPA 1966). In other words, whether or not the Morita et al. reference lists polyimides (col. 11, line 13 to col. 13, line 55) that are identical to one or more of the polyimides listed in the present specification (page 16, line 16 to page 17, line 6, and page 10, line 1 to page 14, line 24) is immaterial.

The courts have held that when one of ordinary skill in the art must pick and choose from the various subject matter contained in a single disclosure, the reference cannot be properly used to support a lack of novelty rejection, but may support an obviousness rejection. In re Arkley, 172 USPQ 524, 526 (CCPA 1972).

To overcome any prima facie obviousness rejection, the courts have held that Applicants are required to compare the invention to the closest prior art, but not to the invention itself. In re Chapman, 148 USPQ 711, 714 (CCPA 1966). In Chapman, the appellants invented improvements in the art of chlorinating polyethylenes. The prior art included the Hoerger Patent and the Noeske Patent. Id. at 712. The Noeske Patent showed all of the features of the process claims except for the molecular weight of the starting polyethylene. Id. at 713. The Hoerger Patent disclosed the chlorination of higher weight polyethylenes recited in Appellants' claims. Id. at 713. The court concluded that the patent examiner had properly established a prima facie case of obviousness in view of the

combination of the Noeske Patent and the Hoerger Patent. Id. at 716. The record included a Rule 132 Declaration previously filed by Appellants, which provided data showing that Appellants' process provided chlorinated polyethylenes having higher ultimate tensile strengths than lower molecular chlorinated polyethylenes of the Noeske Patent. Id. at 715. The court ruled that the Rule 132 Declaration did not have to include experiments substituting the polyethylenes disclosed by the Hoerger Patent into the process disclosed by Noeske because that would amount to comparing the invention to the invention. Id. at 714. Implicit in the courts decision is the reasoning that it makes no sense to compare the invention to the invention, as such a requirement would effectively bar Applicants from rebutting obviousness rejections with experimental evidence.

Assuming that Examiner Graybill has established a proper prima facie case of obviousness (which Applicants do not concede), the present case is similar to Chapman. Specifically, there is no requirement, when submitting experimental evidence of non-obviousness under Rule 132, that Applicants modify the prior art so as to generate comparative data that would amount to comparing the invention with the invention. In Chapman, there were two prior art references, and there was no requirement that Applicant substitute polyethylenes from one reference for the polyethylenes of the other reference for the purpose of comparing the invention to the closest prior art. In the present case, there is only one reference. However, the Morita et al. reference can only support an obviousness rejection (if that) because one skilled in the art would have to pick and choose from the various subject matter lists contained in this reference. In re Arkley at 524. Thus, the rule in Chapman, wherein the Applicant is not required to compare the invention to the invention, should apply to obviousness rejections relying upon a single reference because to conclude otherwise is to bar Applicants from rebutting obviousness rejections with experimental evidence.

As stated in the Rule 132 Declaration, Applicants believe they have compared the invention to the closest prior art, which is Example 1 of the Morita et al. reference (Masuko Declaration, page 3). It makes no sense to compare the invention to the invention, and Applicant is not required to do so when rebutting an obviousness rejection in accordance with the court's decision in Chapman.

Response to (d)

The Examiner argues that "the claimed result cannot be declared unexpected in relation to peel strength of Morita when the relationship between the peel strength of Morita cannot not be determined" (Office Action, dated December 31, 2002, page 21, lines 10-13). There is no conversion factor between the 90 degree peel strength disclosed by Morita and the 17 degree peel strength disclosed by Applicant is immaterial to the results provided in the Masuko Declaration. Specifically, the Masuko Declaration provides a direct comparison between the 17 degree peel strengths of the die-bonding film made in accordance with the present invention to the closest prior art die-bonding film disclosed by Morita. Because the Masuko Declaration provides a direct factual comparison there is no need to rely upon inferences drawn from the Morita reference. In fact, the data provided by the Masuko Declaration shows that any inferences drawn about peel strengths from the Morita reference in support of an obviousness rejection are erroneous. The die-bonding material disclosed by the Morita reference is plainly weaker than the die-bonding material used for bonding in accordance with the conditions recited in claims 17-19, 21-34, and 37-50 of the present invention.

Response to (e)

Lastly, the Examiner asserts that the Morita reference teaches unexpected results of the magnitude shown in the Masuko Declaration (Office Action, dated December 31, 2002,

page 21, lines 14-16). Applicants respectfully disagree. The Examiner relies upon the following statement in Morita as a teaching of unexpected results:

> "However, the treatment effect in the thermoplastic polymer layer of the present invention is remarkable beyond expectations. The adhesive strength to the substrate can be improved and stabilized greatly." (col. 7, lines 65-68).

The Examiner's reliance is upon mere puffery. This section contains no factual information that could be used to negate the superior and unexpected adhesive properties provided by the organic die-bonding film made in accordance with the present invention. There is nothing in the Morita et al. reference to teach, or even suggest, that the bond is so strong that the chips shatter before the adhesive gives way. The present invention truly achieves an adhesive property that "is remarkable beyond expectations."

For all of the reasons argued above, Applicants assert that the Masuko Declaration is sufficient to overcome any prima facie obviousness rejection in view of the Morita et al. reference.

Applicants incorporate herein the arguments made previously in Amendment (B) filed June 19, 2002, and in Supplemental Response to Amendment (B) filed October 16, 2002.

Conclusion

Claims 17-19, 21-34 and 37-50 are now in compliance with 35 U.S.C. 112. The rejection of claims 17-19, 21-27, 31, 33, 37, 40 and 42-50 under 35 U.S.C. 103(a) over the Morita reference is untenable and should be withdrawn because all of the claimed limitations are neither disclosed nor suggested by the reference. Specifically, Morita does not teach or suggest: (a) the bonding "conditions of 100-230°C temperature and pressure of 0.1-30 gf/mm^2" recited in claims 17, 19 and 30; (b) "peel strength of 0.5 kgf/(5 mm x 5 mm chip) or

higher" recited in claim 17 and 30; or (c) "saturation moisture absorption of 1.0% by volume or less" recited in claims 18, 26, and 28-30. Morita et al. also fail to teach, or even suggest, the "organic die-bonding single layer film" having the features recited in claim 19. Furthermore, Applicants have shown that the combination of the Hozoji reference and the Morita et al. reference is untenable and should be withdrawn because there is no reasonable expectation revealed by these references that a mix of the adhesives taught by each reference to the other would provide a void volume of 10% or less in terms of voids present in the material and still have the other properties required by the claims.

Furthermore, Applicants have shown that the organic die-bonding film of the present invention manifests superior and unexpected results, including an invulnerability to reflow cracking and a peel strength markedly improved over the material disclosed by the prior art, as supported by the Masuko Declaration, which sufficiently rebuts any potential prima facie case of obviousness.

For all of the above reasons, claims 17-19, 21-34, and 37-50 are in condition for allowance, and prompt notice of allowance is earnestly solicited. Questions are welcomed by the below-signed attorney for applicants.

Respectfully submitted,
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